

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9603

Roll No.

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B. Tech.

(Semester-I) Theory Examination, 2011-12

ENGINEERING CHEMISTRY

Time : 3 Hours]

[Total Marks : 100

Note : Attempt the questions from each Section as indicated.

Section-A

1. Attempt *all* parts of the following : $2 \times 10 = 20$

- (i) What is Bragg's law?
- (ii) Define calorific value of a fuel.
- (iii) Define the order of a reaction.
- (iv) What is a salt bridge? Write its role in a galvanic cell.
- (v) What is - I effect? Write the halogens in decreasing order of their -I effect.

- (vi) Define the terms 'monomers' and 'functionality'.
- (vii) What is a cation exchange resin? Give one example.
- (viii) Define homopolymer and copolymer. Which of the following are homopolymers ?
Nylon-6, Nylon-6, 6, Starch and Terylene.
- (ix) Phenolphthalein indicator gives pink colour in basic media but colourless in acidic media, why?
- (x) Define condensation polymerization.

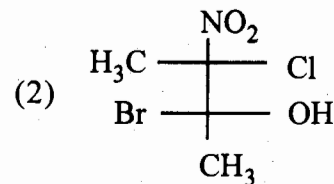
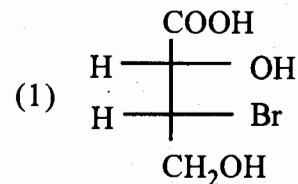
Section-B

2. Attempt any *three* parts of the following : $10 \times 3 = 30$

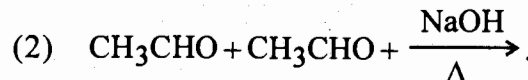
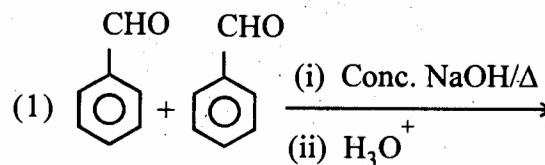
- (a) (i) Define the term 'corrosion'. Discuss in brief the electrochemical theory of corrosion.
- (ii) Explain the paramagnetic behaviour of Oxygen based on molecular orbital theory.

(2)

- (b) (i) Assign R or S configuration of each of the following compounds :



- (ii) Identify and complete the following name reactions :



- (c) What do you understand by equivalent and non-equivalent protons? Define chemical shift in NMR spectroscopy. How many signals will be obtained in the NMR spectrum of the following compounds ?

$\text{CH}_3 - \text{O} - \text{CH}_3$; $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$; CH_3COOH , and $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$.

(3)

- (d) Write a brief note on biodegradable polymers.
- (e) Write the Beer-Lambert law (Absorption law) of UV-Vis spectroscopy. The solution of a compound having concentration 0.1 g/l, gave 0.2 absorbance value when measured using 1.0 cm cell. Calculate its absorptivity and molar absorptivity values. Given, molecular weight of the compound = 200.

Section-C

All questions are compulsory : $10 \times 5 = 50$

3. Attempt any *two* of the following :

- (a) Discuss in brief the basic principle of IR spectroscopy. A compound having molecular formula $C_2H_4O_2$ while studied for its IR analysis resulted the following peaks in its spectrum : $2900-2950\text{ cm}^{-1}$, 1710 cm^{-1} and $3500-3650\text{ cm}^{-1}$. The compound also gave effervescences with Na_2CO_3 . Suggest structure of the compound.

- (b) What is chirality? Write its implications.
- (c) Explain the intermolecular hydrogen bonding. How does it differ from the intramolecular hydrogen bonding?

4. Attempt any *two* of the following :

- (a) Discuss in brief the classification and applications of liquid crystals.
- (b) Copper has an FCC structure and its radius is 1.28 \AA . Calculate its density. Given : Atomic weight of Cu = 63.5 and Avogadro number = 6.02×10^{23} .
- (c) What is optical activity? Which of the following compounds are optically active? Explain, why?
n-propanol, n-butanol, allenes and 2-chlorobutane.

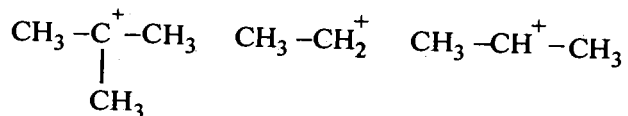
5. Attempt any *two* of the following :

- (a) Write a brief note on fullerenes and discuss their applications.
- (b) What are electrochemical cells? Discuss their working principle with suitable examples.

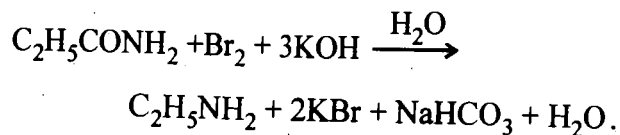
- (c) Derive an equation for half life of a first order reaction. Show that in case of first order reaction, the time required to complete 99.9% reaction is about ten times of its half life.

6. Attempt any *two* of the following :

- (a) Write the structural requirements for hyperconjugation. Explain the application of hyperconjugation in deciding the stability of alkyl carbocations. Write the following in the decreasing stability order and justify :



- (b) Discuss the mechanism of the following reaction :



- (c) Define second order reactions. In the saponification reaction of ethyl acetate the

following results were obtained using equal concentrations of ester and alkali :

t, min	Acid used, ml
0	47.65
4.89	38.92
10.07	32.62
23.66	22.58
∞	11.84

Show that the reaction is second order.

7. Attempt any *two* of the following :

- (a) Compare the merits and demerits of ion exchange process and zeolite process used for water softening.
- (b) What parameters are determined in the proximate analysis of coal? Explain each. Write the properties of a good fuel.
- (c) What is natural rubber? Write its limitations. Discuss the vulcanization process of rubber.